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Abstract

This phase 1 of the project was conducted to develop and evaluate a new inservice education model. An elementary science curriculum, "Science--A Process Approach" (AAAS Science), provided content for the training program which makes use of video tapes, self-study programed text materials, and classes in which teachers use the AAAS classroom materials. In the fall 1968, teachers were placed in four instructional groups on the basis of pretest assessments, with those in one group serving as a control group. At the end of the academic year 1968-69, attitude and achievement tests were administered to the approximately 300 elementary teachers and a random selection of their students along with a random selection of matched students of teachers from outside the program. Analysis of the posttest data permits acceptance of the hypothesis that the IN-STEP approach is an effective and efficient method of conducting inservice training (at least in AAAS Science). Conclusions were based on gain in group mean scores due to the instructional program; generally favorable teacher attitudes; cost effectiveness comparison between IN-STEP approach and a traditional approach; indirect measure of proficiency of IN-STEP students; and moderately favorable indications of a difference in the attitudes toward science of IN-STEP and non-IN-STEP children. (JS)

ED033905

EVALUATION REPORT

PHASE I

Individualized In-Service Teacher Education

(Project IN-STEP)

AN ESEA TITLE III PROJECT (P.L. 89-10)

SDE No. 2320-50-69001

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OFFICE OF EDUCATION

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SP003 277

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John C. Thurber

October, 1969

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INTRODUCTION

We are living in a truly remarkable time. Not only is our knowledge of the universe expanding at a fantastic rate, but the rate at which new educational programs are being produced is something of a phenomenon in itself.

Many of the programs now being developed require a new orientation on the part of all educators who would implement them. They affect not only the content of subject matter disciplines, but the methods and materials that will be used for teaching. Viewed in this light, educational processes, if they are to be successful, can no longer be an undertaking merely in the sense of developing a mind filled with an encylopedic collection of facts. To comprehend all factual knowledge, even in a specialized area has become a physical impossibility. Besides the speed and efficiency of electronic information retrival makes this type of learning outdated.

Needed today are types of learning programs which give one the mental tools, skills and processes necessary for dealing with his intellectual as well as his physical environment. This is true of all types of educational endeavor, including teacher education.

Upon the arising of these new curricula, the challenge of instructional imporvement becomes a many faceted problem for local school boards as well as a matter for national concern. The total picture school systems face in training and retraining teachers involves efficient utilization of both financial and human resources.

With the above stated needs serving as a motivational force the proposal for Project IN-STEP (IN-STEP is an acronym for in-service teacher education program) was written and funded.

INTRODUCTION (CONT.)

Funding for the program is under Title III of ESEA P.L. 89-10. Title III funds are to develop inovative and/or exemplary programs; therefore Title III projects could be thought of as experimental programs to develop and advance creativity in education. It is the aim of Project IN-STEP to meet the challenge of today and tomorrow by developing an efficient, economical and effective model for in-service education.

OBJECTIVES

The general objective of the Project is to develop an effective, economically feasible model for in-service training of teachers.

The effectiveness will be shown by comparing pre- and post-mean scores by participating teachers. The economic feasibility will be demonstrated by comparing costs of training a large number of teachers with the IN-STEP method to the traditional method of extension classes using one college instructor per 30 participating teachers.

A secondary type of evaluation is attempted by a testing program involving students of participating teachers. Attitude surveys were also made of involved students and participating teachers.

PROCEDURES

The first year of the project was devoted to the development of an in-service program to teach teachers to teach Science - A Process Approach (AAAS Science) developed by the American Association for Advancement of Science and adopted for use in the elementary schools in Palm Beach County.

Brief Description of Procedures

The development, implementation and evaluation of the in-service programs connected with this project was divided into three phases each requiring approximately one calendar year to complete.

Phase I: Development, implementation and preliminary evaluation of in-service programs in the AAAS program to begin June 1, 1968.

Phase II: Refinement, further implementation and evaluation of in-service programs developed during Phase I. If Phase I is shown to be successful, development of a program in another subject area will be indicated. To begin June 1, 1969.

Phase III: Subject to results of the evaluation of Phases I and II, Phase III will be concerned with the development, implementation and evaluation of in-service programs in a curriculum area yet to be determined. To begin June 1, 1970.

Procedures for Phase I

June 1, 1968 - Sept. 30. 1968: (1) Development and acquisition devices and procedures for assessing pupils knowledge of the processes and content of Science - A Process Approach, (2) development and acquisition of devices

and procedures for assessing teachers knowledge of the processes and content of science as defined by the program, (3) writing of text materials for various in-service instructional programs, (4) development of video tapes to be used with the program, (5) procurement of demonstration materials to be used in the program.

October 1, 1968 - October 31, 1968: (1) Administration of the assessment devices to 320 teachers involved in the program, (2) organize teachers into four instructional groups on the basis of the above assessment.

October 1, 1968 - April 30, 1969: Implementation of the in-service instructional programs and development of additional video tapes used in them. Implementation of in-service programs by groups was done as follows:

Group I - This group was composed of teachers with workable knowledge of science content and process of science. They received brief instruction in the philosophy of science curriculum, teacher manuals and demonstration materials to be distributed to all teacher participants.

Group II - Those teachers with slightly lower competency than Group I. These teachers received instruction in the philosophy of science curriculum, teacher manuals, demonstration materials, plus self-study text materials.

Group III - Those teachers who demonstrated less competency than the first two groups, but still indicated some basic competencies in science education. This group received instruction in the philosophy of science curriculum, teacher manuals, demonstration materials, self-study text materials, plus audio-visual instruction through a series of 30 video tapes viewed over the facilities of the instructional television network in their respective school.

PROCEDURES (CONT.)

Group IV - This group is composed of those who demonstrated the least competence in the assessment. They received all of the instruction and materials described for the third group plus a series of regular weekly classes directed by the instructors assigned to the project. To encourage teachers to participate in this innovative project, each participating teacher received a training allowance and was eligible to receive college credit at his own expense if desired. The training allowance of $2.50 per hour was based upon estimated number of hours that were required for completion of the instructional program in which the teacher was placed. Estimated times for groups were as follows:

Group I - 30 teachers, 5 hours

Group II - 80 teachers, 15 hours

Group III - 140 teachers, 30 hours

Group IV - 60 teachers, 75 hours

RESULTS

As stated, one method for demonstrating the effectiveness of the program was to compare mean scores of pre- and post-tests administered to the four instructional groups. The test used was the Elementary Science Teachers Inventory developed by Dr. Rodney A. Lane, Dean of the Division of Continuing Education, Florida Atlantic University, Boca Raton, Florida.

This instrument measures the ability of a person to use the processes of science in solving situations presented as well as some measurement of generalized science knowledge.

Instructional Group I was to serve as a control group and the program was to be considered successful if the other instructional groups (II, III, and IV) showed a gain in the mean score which the test would show significant at the .05 level. The pre-test was administered to 299 of the participants and the post-test to 221 participants and the following results were obtained:

Table I

Comparison of Teacher Pre- and Post-Test Scores

Based Upon 56 Test Items

Group	Pre-Test	Post-Test
I	N 26	N 21
Range	M 39.42	M 39.00
37-46	SD 2.83	SD 4.64
	SE 2.89	SE 2.81

t = .363
not significant

RESULTS - Table I - (Cont.)

Group	Pre-Test	Post-Test
II	N 80	N 63.00
Range	M 33.44	M 35.33
31-36	SD 1.76	SD 3.90
	SE 3.21	SE 3.13
t = 3.56 significance .01		
III	N 138	N 106
Range	M 25.14	M 26.75
20-30	SD 3.11	SD 6.39
	SE 3.28	SE 3.24
t = 2.39 significance .02		
IV	N 55	N 31
Range	M 15.04	M 23.10
7-19	SD 3.11	SD 7.32
	SE 3.04	SE 3.20
t = 5.84 significance .01		

Discussion of Teacher Pre- and Post-Test Results

From the results shown in the previous tables, the project met its principle objective and actually exceeded the criteria (.05 level of significance on the t test) in all of the instructional groups which were considered as experimental groups (Groups II, III, and IV). In the actual implementation of the program, Group I was considered as the control group for evaluation purposes.

Discussion of Teacher Pre- and Post-Test Results (Cont.)

Group I mean scores did not change significantly, they actually dropped very slightly, most likely an example of mean regression.

The scores of Group II showed a gain in the mean scores which was significant at the .01 level. This group was the section which worked in the self-study text but did not view the sequence of video tapes or attend a large number of classes.

Group III scores showed a gain in the mean significance at the .02 level. This section viewed the video tape sequence as well as working in the self-study text. Why this group showed a gain at the .02 level of significance when compared with .01 of the other instructional groups is not known. Perhaps there were variables that were not controlled or taken into account. However, this level of significance still surpasses the criteria set up for judging this portion of the evaluation successful.

Group IV scores reflected the largest mean gain of any of the instructional groups. The gain was significant at the .01 level. The gain of this group was highly gratifying because even allowing for mean regression, it points out that this lowest group gained the most from the individualized instruction, the viewing of the tapes and the role playing situations in which the individual teachers were placed during the 15 three-hour class sessions which they attended.

A questionaire was also administered to all of the teachers who were participants in Project IN-STEP. At least seven of the questions included reflected directly upon the attitudes of the teachers involved. The instrument was returned by 274 of the 300 teachers. In many cases teachers for some reason would not always indicate a choice for a particular question. Because of this, percentages for different questions do not always total 100%.

Discussion of Teacher Pre- and Post-Test Results (Cont.)

When a discrepancy is apparent between all groups being considered together and the various groups considered individually it is due to the fact that in scoring and analyzing the questionaire results it was necessary to include the 10% who did not indicate a group placement on the instrument as a separate group. This group is not shown in the tables.

TABLE II
TEACHER QUESTIONAIRE RESULTS

RESPONSES BY PERCENTAGES

1. In Which Instructional Group Were You Placed?

Group I - 10% Group II - 27%

Group III - 41% Group IV - 10%

Omits 10%

Grade You Now Teach?

Grade	All Groups	Group I	Group II	Group III	Group IV
K	1	3	3	0	0
1	16	7	19	16	22
2	16	7	12	17	22
3	1	11	18	15	19
4	12	0	12	11	12
5	12	19	12	12	6
6	18	30	15	16	12
Omits	24	23	9	13	7

2. Sex:

Male	13	34	14	9	3
Female	85	65	86	87	96
Omits	2	1	0	4	1

(10-A)

RESPONSES BY PERCENTAGES (CONT.)

3. Age:	All Groups	Group I	Group II	Group III	Group IV
20-24	7	9	6	3	
25-30	22	26	22	22	19
31-35	14	3	19	11	27
36-40	16	30	14	13	12
Over 40	39	30	35	42	32
Omits	2	4	1	6	7

9-01

4. Years Of Teaching Experience?

Years:					
1-3	21	34	30	15	29
4-6	19	15	22	21	9
7-9	14	11	9	10	16
10-12	9	7	12	8	12
13 or more	36	26	27	40	32
Omits	1	7	0	6	2

(10-B)

5. Have You Ever Taught At A Level Other Than Primary?

Yes	53	53	51	53	61
No	38	38	43	36	38
Omits	9	9	6	11	1

RESPONSES BY PERCENTAGES (CONT.)

6. At What Level Have You Had Most Of Your Teaching Experience?

Grade	All Groups	Group I	Group II	Group III	Group IV
K-3	48	40	52	49	48
4-6	41	32	42	38	38
7-9	4	26	2	2	6
10-12	3	2	2	3	0
Other	3	0	2	1	3
Omits	1	0	0	7	5

7. How Many Of The Following Courses Have You Taken Since Your Secondary School Training?

BIOLOGY:

None	25	11	27	23	29
1	24	30	30	21	9
2	24	23	3	23	12
3	8	7	4	11	3
4 or more	8	15	30	8	6
Omits	11	14	6	14	41

EARTH-SPACE SCIENCE COURSES: (GEOLOGY, METEROLOGY, ASTRONOMY, ETC.)

None	39	30	39	38	41
1	24	26	27	26	12
2	11	19	15	7	3

RESPONSES BY PERCENTAGES (CONT.)

EARTH-SPACE SCIENCE COURSES: (GEOLOGY, METEROLOGY, ASTRONOMY, ETC.) (CONT.)

Grade	All Groups	Group I	Group II	Group III	Group IV
3	4	0	4	5	3
4 or more	7	19	7	6	0
Omits	15	6	8	18	41
PHYSICAL SCIENCE COURSES (CHEMISTRY, PHYSICS, ETC.)					
None	33	26	34	36	16
1	28	34	28	27	25
2	16	15	22	15	16
3	5	7	5	6	3
4 or more	4	18	4	1	0
Omits	14	0	7	15	40
MATHEMATICS COURSES:					
None	25	3	4	4	6
1	31	26	35	25	35
2	26	30	31	28	19
3	5	19	15	18	12
4 or more	12	22	9	12	12
Omits	4	0	6	13	16

RESPONSES BY PERCENTAGES (CONT.)

8. How Many Semester Hours Of Science Have You Had In Preparation For Teaching (1 Quarter = 2/3 Sem. Hour?)

Hours	All Groups	Group I	Group II	Group III	Group IV
0-5	36	30	38	38	29
6-10	25	15	27	24	35
11-15	11	11	8	8	12
16-20	10	7	12	9	9
21 or more	8	26	8	4	
Omits	10	11	7	17	

9. How Long Has It Been Since Last You Had Formal Academic Work In Science. (Do Not Consider IN-STEP With AAAS When Answering This Question.)

Years:					
1-3	27	38	39	24	32
4-6	16	15	19	19	16
7-9	9	15	12	9	12
10-12	8	3	9	18	9
More than 12	40	26	20	30	22
Omits	0	3	1	0	9

RESPONSES BY PERCENTAGES (CONT.)

10. How Many Periods (Time Blocks) Per Week, On The Average, Do You Allow For Science Instruction?

	All Groups	Group I	Group II	Group III	Group IV
None	3	3	1	2	3
1	6	11	5	4	9
2	21	30	22	23	9
3	37	11	46	33	38
4 or more	29	42	26	26	35
Omits	4	3	0	12	6

11. What Length Of Time, On The Average, Do You Normally Allot To A Science Period?

Less than 10 minutes	1	3	0	2	0
11-20 minutes	14	3	18	11	22
21-30 minutes	39	38	39	37	45
31-40 minutes	29	26	27	29	19
more than 40 minutes	13	26	15	11	9
Omits	4	4	1	10	5

12. Does The Classroom In Which You Teach The Science Portion Of Your Curriculum Have:

Easy Access To Water (Sink, Wash Basin, Etc.)

Yes	48	50	47	51	32
No	46	53	39	61	
Omits	6	4	0	10	7

RESPONSES BY PERCENTAGES (CONT.)

Facilities For Heat Experiments (Bunsen Burner, Portable Burner, Hot Plate, Etc.)

	All Groups	Group I	Group II	Group III	Group IV
Yes	30	19	34	32	19
No	59	73	62	55	67
Omits	11	8	4	13	14

13. How Would You Describe:

The Workspace For Children In The Classroom In Which You Teach Science. (Table Space, Storage Space, Space To Set Up Long Term Projects, Etc.)

Completely Satisfactory	8	3	9	11	0
Fair	39	42	42	35	41
Poor	47	53	49	42	54
Omits	6	2	0	12	5

The Basic And Supplemental Textual Materials You Have Had Available In Your (Before AAAS Science) Classroom.)

Completely Satisfactory	7	0	11	5	9
Fair	46	61	50	42	41
Poor	40	38	3	38	45
Omits	7	1	1	15	5

RESPONSES BY PERCENTAGES (CONT.)

14. In Which Portion Of The Curriculum Do You Feel Science Should Be Included?

	All Groups	Group I	Group II	Group III	Group IV
It should be considered one of the basic subjects	78	73	78	79	80
It should be placed in a category with music, art & physical education as an important supplemental area	0	0	1	0	0
It is not appropriate for primary grades	19	23	21	16	19
Omits	3	4	0	5	1

H-01

15. Evaluate The Following:

Your Academic Training To Date (Including Project IN-STEP) To Prepare You To Teach The Science Portion Of Your Curriculum.

Completely Adequate	17	34	19	11	9
Good, but needed supplementation	63	57	76	59	67
Inadequate	26	19	20	29	16
Omits	7	13	1	10	11

RESPONSES BY PERCENTAGES (CONT.)

The Kit Of Materials Supplied For Use With The AAAS "Process Approach" As Basic Equipment For Teaching The Course.

	All Groups	Group I	Group II	Group III	Group IV
Completely Adequate	19	15	15	20	21
Good, But Needs Supplementation	49	57	57	45	54
Needs Considerable Supplementation	13	7	11	12	6
Completely Inadequate	4	3	1	6	9
Omits	15	18	16	17	10

The Teachers Guides Supplied For The "Process Approach"

Completely Adequate	33	23	39	31	35
Good, But Needs Supplementation	40	61	28	40	38
Needs Considerable Supplementation	14	3	19	14	12
Completely Inadequate	4	3	4	1	3
Omits	9	10	10	14	12

I-01

RESPONSES BY PERCENTAGES (CONT.)

The Instruction Provided You In Project IN-STEP To Introduce You To The AAAS Science Course

	All Groups	Group I	Group II	Group III	Group IV
Completely Adequate	21	15	15	19	32
Good, But Needs Supplementation	37	34	31	39	41
Needs Considerable Supplementation	23	7	28	28	16
Completely Inadequate	14	34	20	7	3
Omits	5	10	6	7	8

16. In Your Opinion Is The Amount Of Preparation Necessary For Teaching The "Process Approach" Reasonable For What Might Be Expected To Implement A Curriculum Inovation?

It Is Reasonable	51	61	53	52	41
It Is Reasonable, But Difficult To The Point Of Possibly Adversely Affecting My Normal Teaching Situation	34	23	34	30	48
It Is Completely Unreasonable	5	7	8	4	0
Omits	10	9	5	14	11

17. In Your Opinion Has The Time And Effort Which You Have Expended To Incorporate The "Process Approach" Materials Been Worthwhile?

Yes	77	80	72	72	77
No	17	7	23	13	19
Omits	6	13	5	15	4

RESPONSES BY PERCENTAGES (CONT.)

18. Project IN-STEP Is A Decidely Different Way Of Conducting In-Service Training For Teachers. How Would You Compare It To Former Or More Traditional In-Service Courses?

	All Groups	Group I	Group II	Group III	Group IV
Much Better	25	15	22]	24	35
Better	40	38	35	41	51
Not Any Different	14	15	14	15	3
Worse Than Other Types Of Courses	12	19	22	8	3
Omits	9	13	7	12	8

19. For An Education Course, How Would You Rate IN-STEP With AAAS Science From The Standpoint Of Its Effect On Your Teaching?

Better Than Average	25	19	23	22	29
Above Average	48	38	41	52	61
Below Average	19	26	30	16	9
Omits	8	17	6	10	1

20. Rank In Order From Most Effective (1) To Least Effective (3) Portions Of Project IN-STEP. If You Think All Aspects Were Equally Effective, Mark (4) Only.

SELF-STUDY TEXT

1	18	11	31	19	0
2	27	15	23	29	38
3	14	7	19	13	9

RESPONSES BY PERCENTAGES (CONT.)

20. Continued

	All Groups	Group I	Group II	Group III	Group IV
VIDEO TAPES					
1	12	15	18	8	16
2	30	23	38	58	22
3	16	7	19	34	6
CLASSES CONDUCTED BY INSTRUCTION					
1	18	11	19	18	19
2	23	11	31	30	9
3	16	26	26	10	16
ALL PARTS EQUALLY EFFECTIVE					
4	33	26	13	32	51

21. What Is Your Opinion Of The Time And Effort Required For Successful Participation In Project IN-STEP.

It Is Excessive	8	3	4	7	19
About What Would Be Expected	66	53	54	70	74
The Course Is Too Easy	20	30	36	15	0
Omits	6	14	6	8	7

7-01

(10-L)

RESPONSES BY PERCENTAGES (CONT.)

22. How Would You Evaluate Your "Behavioral Change" In The Teaching Of The Science Portion Of The Curriculum As A Result Of Participating In Project IN-STEP With AAAS?

	All Groups	Group I	Group II	Group III	Group IV
I Already Taught In The Enquiry Vein, So Question Does Not Apply	18	38	23	15	6
I Changed My Way Of Teaching Radically	10	7	7	8	22
I Had To Change My Way Of Teaching To Some Extent	59	46	57	61	58
I Am Dissatisfied With AAAS Science & Therefore Do Not Intend To Change The Way I Teach	2	0	7	0	0
Omits	11	9	6	16	14

23. Describe How You Plan To Utilize AAAS Science In Your Future Teaching

I Plan To Follow The Program Exactly As Outlined In The Teachers Guide	16	15	9	15	41
I Plan To Use The Program, Departing In Several Areas I Feel Are Appropriate	68	65	77	8	54
I Will Not Use The Program, But Will Use Certain Activities	1	11	8	61	0

W-01

(10-M)

RESPONSES BY PERCENTAGES (CONT.)

23. Continued

	All Groups	Group I	Group II	Group III	Group IV
I Do Not Intend To Use The Course At All	8	0	1	0	0
Omits	7	9	5	16	5

24. What Is Your Opinion Of The Effect The 'Process Approach' Has On Students Apart From The Science Portion Of Their Curriculum? For Example: Has The Work Appeared To Affect Their Work In Reading, Social Studies Mathematics, Etc?

There Seems To Be Considerable Positive Effect (Transfer) On Other Areas Of The Curriculum	13	11	11	14	6
There Is Some Effect (Transfer) On Other Curriculum Areas	45	46	46	40	58
There Is No Noticeable Effect (Transfer) On Other Curriculum Areas	25	26	26	27	19
There Is A Negative Effect (Transfer) On Other Curriculum Areas	2	0	1	1	3
Omits	15	17	16	18	14

N-01

(10-N)

RESPONSES BY PERCENTAGES (CONT.)

25. Did You Enjoy Taking Part In Project IN-STEP?

	All Groups	Group I	Group II	Group III	Group IV
Yes	80	61	70	83	96
No	15	23	26	11	3
Omits	5	16	4	6	1

27. Would You Recomend Participation In Project IN-STEP As A Means Of Getting In-Service Training In Science Education To Other Teachers Who Might Wish To Implement AAAS In Their Classrooms?

Yes	81	69	77	83	90
No	11	15	19	7	3
Omits	8	16	96	90	7

10-01

28. If You Had To Have In-Service Training In Another Curriculum Area Which Type Of Class Would You Prefer?

A Situation Similar To Project IN-STEP With AAAS Science	73	53	76	74	80
A Formal (Traditional) Lecture Class	15	23	15	12	12
Omits	12	24	9	14	8

(10-01)

DISCUSSION OF QUESTIONAIRE RESULTS

The attitude of teachers towards the way in which they are being trained in a particular subject should reflect in their implementation of the subject. For this reason it was considered important to attempt a measure of the participating teachers attitudes. This was examined in some detail.

The last section of question 15 provides some interesting background concerning teachers' feeling towards the instruction provided them during the course. It may be noted that while 49% of Group I felt the instruction at least good, 34% felt it inadequate. Once again, it should be pointed out that Group I received an absolute minimum of instruction as they served as the control group. Their reaction should be contrasted, for instance, with Group IV, where 73% felt the instruction at least good, while only 3% felt it completely inadequate. It is apparent that with an increasing amount of time spent in the groups there is a shift in the feeling of adequacy of instructions. Perhaps this is indicative that there is a component of a teacher's personality developed as a result of exposure through the years to an idea (possibly mistaken) that the more time spent studying something, the more thorough the study or knowledge gained. The concept of individualized study in this project is not necessarily in agreement with this concept. The results of the comparison between teacher pre-test and post-test levels of achievement for instance would tend to dispute this idea.

Question 17 elicited a flat "yes" or "no" response to the worth of the program. Viewed in the light of their response to question 15, the feeling of Group I on this matter is most intriguing. It is worthy to note that 77% of the total group considered the program worthwhile.

DISCUSSION OF QUESTIONAIRE RESULTS (CONT.)

Question 18 provides a comparison of teachers feeling about the IN-STEP method of instruction vis a vis a more traditional approach towards in-service instruction. Here again, there appears to be a correlation between the amount of time spent in study and the feeling toward the method of instruction. This ranges from 58 per cent of Group I feeling that the method was at least better, to 86 per cent of Group IV believing that the method was better.

In question 19, effort was made to compare the IN-STEP course of instruction with other education courses as to the effect upon the teachers practice within the classroom. Here we find, of the total group, 73 per cent found the course to be at least above average and that 90 per cent of Group IV found the course to be at least above average.

The attitude of the participating teachers towards the effectiveness of the various instructional techniques employed is reflected in question 20. This data seems to indicate that teachers were about evenly divided as to which facet of the program provided the most effective instruction. When considering the total group there was a very slight trend towards the self-study text; however, it must be realized that the strength of this trend would be on the higher percentage of teachers ranking the text in second place as well as first. It should also be pointed out that 33 per cent of the teachers marked item No. 4 (all all parts equally effective).

Question 21 provides useful information on teacher's thoughts about the amount of time and effort required to complete the courses of instruction in the various instructional groups. Pointed out by the data is the indication that most teachers seem to feel that the amount of instruction is about what would be expected. Also of interest is the showing that the percentage of those feeling the course was too easy, declined in proportion to the amount of time spent in the course of instruction.

DISCUSSION OF QUESTIONAIRE RESULTS (CONT.)

Since the subject in which the teachers were trained, Science - A Process Approach (AAAS Science) demanded a "behavioral change" in the classroom on the teachers part, (unless they were already using the process approach) the data in question 22 is probably the most important in the whole questionaire. Noteworthy is the fact that 69 per cent of the total group changed their teaching methodology to an extent and that beginning with Group I which indicated 53 per cent the groups arranged themselves in ascending order, Group II, 64 per cent, Group III, 69 per cent, Group IV, 80 per cent of the teachers who changed their behavior in the classroom. The data from this question also points to the reliability of the test used to screen teachers for placement into the various instructional groups.

This is shown by the responses from those who indicated that they already taught in the "enquiry vein". Since the test was designed to test how teachers react to certain problems, the solving of which depends on their knowledge and ability to use the processes of science, the results of this question show that, not only were teachers of Group I more cognizant of the process approach than other groups, but also felt they were actually implementing the approach to a greater degree in their teaching. The trend in the percentage of teachers in each group who already felt they were teaching with the prescribed method (Group I, 38 per cent, Group II, 23 per cent, Group III, 15 per cent, Group IV, 6 per cent) is that which would be expected if the test is valid.

A further indication of teachers attitude is shown by question 23 in that only 8 per cent of the teachers trained do not plan to use the AAAS Science materials. Considering the fact that AAAS is quite a radical departure from the "traditional" science approach and that persons frequently resist

change for a number of reasons, this data seems to indicate not only approval of AAAS materials, but also shows that the project was successful in overcoming resistance to change.

Question 25 was a simple straightforward inquiry as to enjoyment in taking part in Project IN-STEP. Only 15 per cent of the total group indicated a negative reaction. Enjoyment of the program also seems to have a direct correlation to the amount of time spent in instruction, with those who participated the maximum amount (Group IV) indicating the maximum percentage of enjoyment (96%).

In question 28, there is a further indication of the participating teachers overall impression of the program. Here is pointed out that if they were to take part in another in-service class, only 15% of the total group would prefer a "Traditional" type of course as compared to the method developed by Project IN-STEP.

DISCUSSION OF ECONOMIC FEASIBILITY

One of the charges given the project staff was to develop a project that was not only successful in training teachers, but also one which was sound economically. This economic feasibility should also apply to human resources as well as those which are financial in nature. The following figures present a hypothetical situation for a county which would like to train 300 teachers in AAAS Science during a 10 week time span. The county is assumed to have a science education coordinator (salary, $12,000/year) who will devote full time to the program for 12 weeks at a salary cost of $3,000/year. The data shown represents approximations based upon actual experience of IN-STEP personnel. The cost figures for the traditional class represents a non-credit workshop offered by a state university.

Traditional Class		IN-STEP Method
300	Total Number of Teachers	300
30	Teachers Per Section	30
10	Number of Sections	10
10	Number of Instructors	1
$ 1,000.00	Price For Instructor	$ 3,000.00
10,000.00	Total Cost Instruction	3,000.00
0	Cost of Video Tapes or Kinescopes	1,100.00
500.00	Add. Materials & Office Supplies	500.00
170.00	Instructors Per Diem	0
500.00	Est. Travel Cost	0
$11,170.00	Total Cost	$ 4,600.00
37.23	Cost/Teacher	15.33

The data shown reveals that the in-service program provided by IN-STEP can train a teacher at less than one-half of the cost of a traditional approach. It should be pointed out that this table does not show the cost of implementing the program which would be the same no matter how the teachers were trained.

STUDENT TEST RESULTS

Due to production problems the project was not able to secure completed copies of the student achievement tests, which they had developed, from the printing company in time to pre- and post-test the students. This made it impossible to follow the initial (single group, pre-test - post-test) design. An alternative was decided upon; this was the post-test only two group evaluation design described by Stanley and Campbell on pages 25 and 26 of the booklet "Experimental and Quasi-Experimental Designs for Research". This design calls for the establishment of a randomly selected control group, the administration of the assessment instruments to randomly selected students of program participants, and randomly selected students from the control group Comparisons were then made.

Two instruments were developed to measure student achievement in two specific processes of the AAAS Science program. One of these instruments was to measure achievement in the process "Observation" and the other in the process "Measurement". The test on the observation process returned from the printer in time for use as a post-test only and the process measurement instrument was not received from the publisher until the children had already been dismissed for the summer. Since the tests were new and had not been in use before, there was no validation data nor norms. It was therefore decided to test control and experimental groups in the second, fourth and sixth grades in order to see where the test might fit best and perhaps even develop three sets of norms for the test.

Student attitude toward science was measured with a Q-sort device developed by the project. The Q-sort test was printed on IBM cards which not only facilitated the taking of the test but also the scoring. Line drawing pictures were printed on the IBM cards and the various pictures were assigned scoring weight based on a judge deck.

TABLE III

STUDENT ACHIEVEMENT TEST RESULTS

As stated, the test on the process of "Observation" was given to grades 2, 4, and 6 in randomly selected control and experimental groups. The following results were obtained:

	Experimental	Control
Grade 2	N - 76	N - 35
	SD - 3.52	SD - 2.18
	M - 10.67	M - 8.71
	t = 3.69 significance = .01	
Grade 4	N - 120	N - 48
	SD - 3.31	SD - 2.94
	M - 10.07	M - 10.73
	t = -1.29 not significant	
Grade 6	N - 128	N - 83
	SD - 2.37	SD - 2.66
	M - 12.14	M - 12.66
	t = -.91 not significant	

Discussion of Student Achievement Test Results

A casual glance at the preceding table without some background of the AAAS program might produce the question, "Why was there no significant difference in favor of the experimental group in the fourth and sixth grade?" This is a valid question, indeed one which the project staff asked itself, and the answer apparently lies in the structure of the AAAS Science program.

TABLE III - STUDENT ACHIEVEMENT TEST RESULTS (CONT.)

In Science - A Process Approach the exercises for the primary grades stress the skills of: Observing, Classifying, Using Space/Time Relationships, etc. These basic processes provide the foundation for the more complex or integrated processes.....Formulating Hypotheses, Controlling Variables, etc. which form the basis for instruction in the intermediate grades. In other words, the process Observing is not presented to the students as such after the primary grades and the only exposure that a fourth or sixth grade child would have to the process would be as it was inter-related or involved in another, usually more sophisticated, process. In addition, it is quite safe to say, since AAAS had not been used on a wide scale in Palm Beach County before this year, that the children in the experimental group did not have exposure to the course in the primary grades where observation was stressed; indeed there is the distinct possibility that some of the children in the control group may have had this exposure. This is possible in the light of the transient nature of certain sections of the student body in Palm Beach County.

In the second grade however, there variables would be at a minimum (particularly with reference to prior exposure to materials) as there were only five kindergartens operating last year and these for the first time, and only a limited number of first grade teachers had been trained previously.

Although the test needs to be given to more students in order to determine its validity, some tentative assumptions may be indicated.

1. That the test is useful for comparison between groups in the second grade.
2. That if this is the case there was a significant difference at .01 level between the control group (non-AAAS) and those second grade students whose teachers participated in AAAS training by project IN-STEP.

TABLE III - STUDENT ACHIEVEMENT TEST RESULTS (CONT.)

3. That, very possibly the test is not adequate to measure student achievement at the fourth and sixth grade levels since the process of observing is not presented as such in those levels.
4. That the second grade children who had had AAAS training from IN-STEP trained teachers scored higher than one fourth grade group and practically as high as the other.
5. That possibly by the fourth and sixth grades, students develop some skills in the process of observing on their own at least as measured by this particular test.
6. That undoubtedly there are additional variables operating which were not controlled.

Q-SORT ATTITUDE MEASURE RESULTS

The Q-sort test was composed, as stated, of a packet of I.B.M. cards with line drawings depicting youngsters involved with various states of activity dealing with science. These activity states varied from negative actions towards science (breaking science equipment and tearing up science books) through passive states, to positive action states. (children involved in "experiments"). The test was designed to measure children's identification with the type of feeling they had towards science at that particular time. There were 14 cards in the packet and an indentification card. Students were given the cards with the following instructions.....

In the packet are 14 cards with pictures on them. Imagine that boy or girl in the picture is you. Look at all the pictures.

Pick the <u>one</u> that is <u>most</u> like you and put it at the top of your desk.

Pick the <u>one</u> that is <u>least</u> like you and put it at the bottom of the desk.

Q-SORT ATTITUDE MEASURE RESULTS (CONT.)

Now pick the two cards that are NEXT MOST like you (after the first one) and place them below the one most like you.

Now pick the two LEAST like you and put them above the one least like you.

Now pick the three that are NEXT MOST like you and place below the row of two that are like you.

Now pick the three that are LEAST like you and place them in the row below the last three you put down.

You should have two cards left over. Do you?

Don't pick up the cards until I tell you and then do it just as I say.

Place the card LEAST like you on the top of the two cards you had left over. Then put the two cards on the bottom row on top of the others. Then the three cards from the bottom row on top.....then three cards again on top....then two cards on top....then the last card on top of the pile.

The top card on your pile of cards should be the one you chose as most like you, is it? If so, put your identification card on top and turn all your cards in.

DISCUSSION OF Q-SORT ATTITUDE SURVEY RESULTS

Using this technique, the attitude of sixth graders towards science was conducted using a control group of 53 having no special treatment and an experimental (AAAS students) of 181. Positive illustrations were assigned....high weight if chosen as best liked and descending weight if chosen as poorest liked. Similarly, traits judged as representing poor attitudes were assigned high weights if sorted towards the bottom of the scale, and descending weights as sorted towards the top of the scale.

DISCUSSION OF Q-SORT ATTITUDE SURVEY RESULTS (CONT.)

Scores of the two groups were compared and there was a moderate difference in the two group's attitude. This difference was at the 10% level of significance. This was considered favorable by the staff as measurements in the affective domain of educational goals are difficult in the least. One variable which may have had an effect was the fact that the test was administered during the week of the Apollo 10 launch and one of the cards dealt with the space program. Undoubtedly, there were other variables which may have escaped the attention of the testers.

SUMMARY

The purpose of Phase I of Project IN-STEP was to develop and evaluate a new method for conducting in-service education for teachers. The criteria set forth were that the method be: 1) Effective 2) Economical and 3) Efficient. The method to be used was an individualized multi-media approach. The curriculum which was to serve as the vehicle for development of the in-service training model was the contemporary elementary science education program Science - A Process Approach (AAAS Science). Phase I was conducted during a 12 month period from July 1, 1968 to June 30, 1969.

Teachers were pre-tested in the early fall of 1968 and placed in the various instructional groups as prescribed by the project, with those teachers who were placed in Instructional Group I serving as a control group to assist in measuring the effectiveness of the program. These teachers were then instructed by means of:

1. Video tapes
2. Self-study programmed text materials
3. Classes conducted by the IN-STEP instructors in which they actually used the AAAS classroom materials.

At the end of the academic year 1968-69 the approximately 300 public school and non-public school elementary teachers were post-tested and a random selection of their students was also post-tested along with a random selection of matched students of teachers from outside the program. The device used for the teacher pre- and post-test was developed by Dr. Rodney A. Lane of Florida Atlantic University and the IN-STEP staff.

SUMMARY (CONT.)

Analysis of the data from the testing permits acceptance of the hypothesis that the "IN-STEP approach" is a successful method of conducting in-service tarining for teachers (at least in AAAS Science) in that the criteria set forth for determining success in Phase I were met. This statement is based upon:

1. Gain in the mean scores of instructional groups II, III and IV, generally at the .01 level of significance, due to the instructional program.
2. The generally favorable attitude of the teachers who participated as reflected in the questionaire.
3. The cost effectiveness comparison between training a hypothetical group of 300 teachers in AAAS Science with IN-STEP materials as compared with a traditional approach to training a like number of teachers.
4. Indirect measure of proficiency on one of the basic processes of AAAS Science of second grade students whose teachers had participated in the project. This test was indicated to be most likely not a valid test for any but the primary grades for reasons discussed in the Student Achievement Test Results section of this report.
5. A moderately favorable indication of a difference in the attitude towards science in the attitude of sixth grade children (the only grade surveyed) whose teachers were trained in AAAS with the IN-STEP program compared to a random sampling of other sixth grade children in the county.

SUMMARY (CONT.)

6. The fact that other school systems are now using the IN-STEP materials in training teachers in AAAS Science.

   Because of a tendency of the public to be awed by the television (video tape) aspect of Project IN-STEP, the project staff wishes to point out most forcefully that use of the video tapes or kinescopes of these tapes is only one component of a many faceted program. The total program in order to be successful requires use of the self-study materials and classes in which teachers actually are involved in using AAAS materials.

The final evaluation of Project IN-STEP will depend upon the successful completion of Phase III during which time the model developed in Phase I, refined in Phase II will be applied in another curriculum area. Success in Phase I and the preliminary study in Phase II point towards successful transfer of the model.

JCT:aw

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